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Spread of Measles in Europe and Implications for US Travelers

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Abstract

From January 2018 to June 2018, World Health Organization (WHO) European Region countries reported >41 000 measles cases, including 37 deaths, a record high since the 1990s. Low vaccination coverage in previous years is the biggest contributing factor to the increase in cases. The Ukraine reported the majority of cases, but France, Georgia, Greece, Italy, the Russian Federation, and Serbia also reported high case counts. Europe is the most common travel destination worldwide and is widely perceived as being without substantial infectious disease risks. For this reason, travelers may not consider the relevance of a pretravel health consultation, including vaccination, in their predeparture plans. Measles is highly contagious, and the record number of measles cases in the WHO European Region not only puts unvaccinated and inadequately vaccinated travelers at risk but also increases the risk for nontraveling US residents who come into close contact with returned travelers who are ill. The US Centers for Disease Control and Prevention encourage US travelers to be aware of measles virus transmission in Europe and receive all recommended vaccinations, including for measles, before traveling abroad. Health care providers must maintain a high degree of suspicion for measles among travelers returning from Europe or people with close contact with international travelers who present with a febrile rash illness. The current WHO European Region outbreak should serve to remind health care providers to stay current with the epidemiology of highly transmissible diseases, such as

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measles, through media, WHO, and Centers for Disease Control and Prevention reports and encourage measles vaccination for international travelers.

More people are traveling internationally than ever before,[1] and travelers who acquire communicable diseases while abroad can put communities and susceptible populations at risk on returning home.[2] One important communicable disease is measles.[3,4] Spread person to person by aerosolized droplets, measles is highly contagious; 9 of 10 susceptible people exposed to measles will likely fall ill.[5,6] The illness usually affects children,[4] who most often have complications, including diarrhea, otitis media, pneumonia, acute encephalitis, and, rarely, subacute sclerosing panencephalitis, a degenerative nervous system disease with progressive neurologic findings and death.[6] Although worldwide measles case counts are declining,[3,4] certain populations, including unimmunized (or partially immunized) international travelers, are at increased risk for infection.[7] Recently, large measles outbreaks and record case counts in the World Health Organization (WHO) European Region in 2018 have demonstrated that measles is a threat beyond the developing world and that measles virus transmission to travelers can occur in the Western Hemisphere.

The large number of measles infections in the WHO European Region, which includes 53 countries throughout the European continent, is a global concern because the European continent is the most common travel destination worldwide. In 2017, among the >1.3 billion international arrivals globally, >670 million (51%) were to Europe, an 8% increase from 2016.[1] Several Western European countries also rank among the top 10 destinations for US travelers. In 2015, ~7.1 million US travelers departed for the United Kingdom, 2.8 million for Germany, and 2.5 million for Italy, making these countries the third, seventh, and 10th most popular travel destinations for Americans, respectively.[8]

In this review, we explore current measles epidemiology, including the record case counts in the WHO European Region in 2018; existing knowledge about measles and international travelers; and the implications European measles outbreaks have on the pre-, during-, and posttravel care of US travelers.

GLOBAL AND US MEASLES EPIDEMIOLOGY

From 2000 to 2016, worldwide measles incidence decreased 87%, and deaths decreased 84%.[9] Despite these declines and the available vaccine, measles continues to be reported. In 2016, the WHO reported an estimated 85% coverage with the first dose of the measles vaccine but only 64% coverage with the second dose.[3] Herd immunity in a given location is effective only when coverage with the second dose of the vaccine is ≥95%.[10] Despite the availability of a vaccine, measles continues to be a leading cause of death among children.[4] In 2016, among 132 000 reported cases, most occurred among children <5 years of age[4,9.]

After the licensure and introduction of a live-attenuated measles vaccine in 1963 in the United States, measles incidence in the country declined rapidly, from ~500 000 cases reported that year to <100 000 cases in 1968.[6,11] In 2000, measles was declared eliminated from the United States, after robust surveillance did not detect a case for >12 months.[12] In the United States, measles elimination is defined as the absence of endemic virus

transmission for ≥12 months in an area with a high-quality surveillance system that meets the targets of key performance indicators.[9] Since 1996, measles vaccine coverage has been maintained at ≥90%.[13,14]

Although measles was eliminated in the United States in 2000, cases continue to be imported into the country, and domestic outbreaks continue to occur because of these importations. Since 2008, the annual measles case count in the United States has ranged from 55 (in 2012) to 667 (in 2014).[15] As of December 20, 2018, 336 measles cases from 26 states and the District of Columbia have been reported, including 17 outbreaks, defined as 3 or more linked cases. From January 1, 2019 to May 17, 2019, an additional 880 measles cases from 24 states have been reported to the Centers for Disease Control and Prevention (CDC).[15]

MEASLES IN EUROPE: 2018

In 2018, the WHO European Regional Verification Commission for Measles and Rubella Elimination verified measles elimination (defined by the WHO as interrupted transmission for at least 36 months) in 37 (70%) of the 53 WHO European Region countries. Twenty-four months of interrupted measles transmission has been reported in an additional 6 countries: Austria, Kazakhstan, Kyrgyzstan, Poland, Switzerland, and Turkey. Measles is considered endemic in Belgium, Bosnia and Herzegovina, France, Georgia, Germany, Italy, Romania, the Russian Federation, Serbia, and the Ukraine[16] (Table 1).

Typical annual case counts in the WHO European Region between 2010 and 2017 ranged from 5000 to 24 000.[18] However, in 2018, measles cases reached a record high in this region,[18] with >41 000 cases and 37 deaths reported over a 6-month period from January through June.[19] Of these, 45% were in children 15 years of age or older, but the highest incidence was in children <1 year old, who were too young to receive the first dose of the vaccine.[19] The Ukraine reported the majority of infections with >23 000 cases, and France, Georgia, Greece, Italy, the Russian Federation, and Serbia (which also reported the most deaths) all reported high case counts.[18] From July 2017 through June 2018, the incidence of measles exceeded 600 cases per 1 million persons in both Serbia and the Ukraine[20] (Table 1).

The cause of the record-high measles case count in the WHO European Region is due to low immunization coverage; 87% of reported case patients were unimmunized.[19] Europe has variable vaccination rates among populations and communities, ranging from <70% to 95%.[18] Parental, societal, or cultural opposition to (or mistrust of) vaccination; regional instability; and a general lack of knowledge about vaccine importance or safety are potential contributing factors to low vaccination rates. Underserved minorities and certain religious groups are more frequently involved in vaccine-preventable disease outbreaks in Europe. These groups may have cultural perceptions that vaccines are not “healthy”; they may have religious beliefs that promote spirituality over medical care and may have poor access to health care; they may also have perceived nonseverity of disease, fear of vaccine side effects, or a lack of evidence-based information on vaccines.[21]

MEASLES AND INTERNATIONAL TRAVEL

Survey estimates suggest that measles outbreaks in countries with mobile populations, such as migrants immigrating to Europe, may lead to the international spread of infectious diseases, such as measles. [22] In the past 10 years, multiple measles outbreaks associated with disease imported from Europe have been reported in the United States. In 2011, most of the 46 cases of measles imported to the United States came from France,[15,23] which was experiencing an outbreak of ~10 000 measles cases from January to April.[23] Half of all imported cases to the United States in 2013 were from the WHO European Region.[24] Of the 336 US measles cases reported as of December 20, 2018, 40 (12%) were imported from Europe, and 12 of these (68%) led to local US outbreaks (institutional data, CDC).

Unvaccinated or inadequately vaccinated international travelers may become infected with the measles virus in various ways, including contact with an ill person during travel abroad, [25] plane flights or other transport,[26,27] or a layover at a location with other international travelers.[28,29] Reports of measles transmission in international airports or during transit to a destination, even at the domestic terminals of international airports,[26-29] illustrate the high transmissibility of the measles virus and its ability to spread internationally. The measles virus is transmitted via direct contact with droplets or airborne spread and may remain airborne for up to 2 hours after an ill person leaves an enclosed area,[4-6] creating an opportunity for transmission to occur without person-to-person contact.[5,6]

In the United States, measles cases are classified as internationally imported or domestically acquired. Internationally imported cases are those in which the patient acquired the illness outside of the United States (ie, had at least part of his or her exposure period while traveling abroad). Domestically acquired cases are those in which the patient acquired measles in the United States (ie, had not traveled or were known to be exposed to measles within the United States). Unvaccinated or inadequately vaccinated international travelers may transmit the disease to susceptible populations after returning home, causing domestically acquired cases. [25] From 2001 to 2015, >2000 measles cases were reported in the United States, of which 535 (27%) were imported[30]; 87% of all imported case patients were not previously vaccinated against measles, and US residents accounted for 62% of imported cases among unvaccinated travelers.[31]

Reports of increases in the number of measles cases above what is expected for a given country may prompt the CDC Travelers' Health Branch to post a travel health notice (THN). The CDC uses THNs to inform travelers and health care providers about health issues at particular destinations,[32] and the decision to post a THN is based on travelers' risk of acquiring a disease. The Travelers' Health Branch has posted 16 THNs for countries with measles outbreaks in 2018; 8 are in the WHO European Region (England, France, Greece, Italy, Moldova, Romania, Serbia, and the Ukraine).[33]

IMPLICATIONS OF INCREASED EUROPEAN CASES FOR US TRAVELERS AND HEALTH CARE PROVIDERS

Similar to in other countries that have eliminated measles, measles cases in the United States are directly or indirectly the result of international travel[33]; as long as measles remains endemic in other countries, the United States will be challenged by measles importations. The record case counts throughout the WHO European Region in 2018 has increased the potential risk of exposure to measles because the countries with the highest number of measles cases are among those most frequently visited.

Western Europe, including England, France, Greece, and Italy, is widely perceived as being without substantial infectious disease risks for US travelers in which few (if any) travel immunizations are needed. This perception may contribute to inadequate pretravel preparedness, such as vaccination, by some travelers and their children. In 1 study of US pretravel health care clinics, among 6612 adults eligible for measles-mumps-rubella (MMR) vaccination, more than half (53%) were not vaccinated at the clinic visit, most frequently because the traveler refused (48% of those not vaccinated).[17] In the same study, 399 travelers to Europe were eligible for the MMR vaccine; 131 (33%) were not vaccinated at the visit.[17]

The high frequency of missed vaccination and vaccine refusal is surprising because travelers who attend a pretravel health consultation with a health care provider are typically concerned about receiving protection for health risks they may encounter while traveling. The reason one-third of travelers to Europe missed an opportunity for measles vaccination remains unclear; it may represent a lack of concern or awareness on the part of travelers[34] and the health care providers about acquiring measles in Europe.

Costs associated with measles outbreaks are not limited to the immediate, short-term impact on the health of the individuals involved. Immunologic, financial, and health system costs are also associated with measles outbreaks.[35] Immunologic costs include postinfection immunosuppression, which can lead to secondary infections,[35] and an overall increase in postinfection all-cause mortality.[36] The financial cost of providing both patient treatment and coordinating a public health response (including contact tracing, provision of postexposure prophylaxis, laboratory testing, communication efforts, and quarantine) to address a single case of measles in the United States can approach $150 000.[35] Lastly, the systemic strain imposed due to reallocation of resources from other programs and increased personnel hours may disrupt public health action for other diseases.[35]

Pretravel Considerations

The CDC recommends that all travelers, including those going to the WHO European Region, be up to date on their vaccinations before travel.[37-39] Health care providers should continue to identify travelers who are eligible for vaccination and provide evidence-based information about the benefits and risks associated with vaccines. All travelers should have presumptive evidence of measles immunity before travel, especially when going to countries identified by a THN as having a measles outbreak. Presumptive immunity to measles is

defined as 1 or more of the following: birth before 1957, laboratory evidence of immunity or infection, 1 or more doses of a measles-containing vaccine administered for preschool-aged children and low-risk adults, or 2 doses of measles vaccine among school-aged children and high-risk adults, including international travelers.[5,40]

The Advisory Committee on Immunization Practices (ACIP) standard recommendation for measles vaccination of children includes 2 doses: 1 given at 12 to 15 months of age and the second given at 4 to 6 years of age.[40] ACIP provides additional recommendations for measles immunization before traveling outside the United States (Table 2). Travelers between 6 and 11 months of age should receive a single dose of the MMR vaccine if traveling to a measles-endemic country[40,41]; if the child receives a dose of the MMR vaccine at <12 months of age, this dose does not count toward the 2 doses recommended after 12 months of age.[40] Children ≥12 months old and adults who do not otherwise have evidence of presumptive immunity should receive 2 doses of the MMR vaccine separated by at least 28 days, with the first dose administered at age ≥12 months.[24,40] Health care providers providing care to travelers with infants should discuss the risk of international travel with an infant <6 months of age because some infants can be susceptible to measles as early as birth because of waning of maternal antibodies.[42]

As noted, subacute sclerosing panencephalitis and severe illness presentations occur at higher rates among younger age groups.[43,44] Avoiding international travel with nonimmune infants and performing early vaccination at 6 to 12 months of age per the ACIP recommendations if travel is unavoidable are of utmost importance. Other at-risk populations (eg, immunocompromised individuals and pregnant women), for whom vaccination against the measles virus is contraindicated, may consider alternative destinations or delay travel to measles-endemic destinations or areas with known, ongoing measles outbreaks.

During-Travel Considerations

During international travel to and from Europe, US travelers should remain aware of the potential for measles virus transmission and try to avoid close contact with ill adults and children both during transit and at their destination. Avoidance may be difficult, however, given that measles is contagious before the characteristic rash develops.[5,28,29] Travelers experiencing symptoms consistent with measles should seek health care immediately. They should inform health care providers abroad about their immunization status and carry a copy of their immunization records for both themselves and their children. All types of travelers (tourists, migrants, those visiting friends and relatives, missionaries, etc) are at risk for acquiring measles; tourists accounted for the largest number (44%) of measles cases reported to the GeoSentinel Global Surveillance Network, followed by business travelers (29%) and those visiting friends and relatives (17%).[27]

Posttravel Considerations

Given the record number of cases in the WHO European Region in 2018, health care providers should suspect measles in any international traveler with recent travel to Europe (and anyone who had close contact with them) who presents with a febrile rash illness.

When documenting a history, health care providers should ask about travel and vaccinations while maintaining a high degree of suspicion for communicable diseases to ensure appropriate treatment of the patient and protect the health of the US public. Health care providers should refer to the CDC's THNs for a given destination to help in developing a differential diagnosis, but bear in mind that the absence of a measles THN for a destination does not imply there is no risk of measles there. Health care providers must also consider that measles can be contracted during transit home (eg, at airports) even if travel was not to a country with a measles outbreak.

If travelers feel ill after returning home, they should seek health care immediately. To avoid the transmission of measles in an emergency department or other health care setting, travelers should call ahead to their place of care and provide information on their symptoms, recent travel, and immunization status. If measles is suspected, health care providers should isolate travelers immediately, placing them on airborne precautions until day 4 of the rash. All health institutions and health care providers should follow airborne precautions when providing care to patients with measles.[5] Health care providers should contact their local or state health department to determine individual state measles-reporting requirements.[45]

Postexposure prophylaxis is a consideration for unvaccinated or inadequately vaccinated travelers with known or highly suspected measles exposure.[5,45] Individuals should receive immunoglobulin at a dose of 0.5 mL/kg intramuscularly or 400 mg/kg intravenously if they present to health care within 6 days of exposure and the MMR vaccine if they present within 72 hours of exposure.[45] Pregnant women, children <6 months old, and immunocompromised travelers with a potential measles exposure should be prioritized. All persons who receive postexposure prophylaxis should be monitored for 21 days (1 incubation period) for the development of symptoms consistent with measles infection.[45]

Outbreak Considerations

Outbreak response is pivotal to stopping measles outbreaks. Conducting robust surveillance and case detection, communicating with the public, managing cases effectively, and strengthening immunization programs are key components of measles outbreak response.[46] National immunization campaigns are important for measles prevention[4]; the 2012–2020 Global Measles and Rubella Strategic Plan describes the goal of the Measles and Rubella Initiative (the American Red Cross, CDC, United Nations Children's Fund, United Nations Foundation, and WHO) to eliminate measles in at least 5 WHO regions by 2020.[7] Challenges to plan implementation include high mobility of populations, suboptimal measles surveillance, and negative vaccine perceptions.[7]

Promoting and encouraging measles vaccination is the cornerstone of disease prevention and elimination. Even among highly immunized populations (eg, New Zealand, where immunity is ~90%), outbreaks may still occur if international travelers import measles.[47] In Europe, the WHO is providing supplemental immunization and surveillance in affected member states.[18] European health authorities are also promoting measles vaccination among local and mobile or migrant populations.

CONCLUSIONS

Record numbers of measles cases in the WHO European Region in 2018 are a public health concern for US travelers to Europe and US residents who come into close contact with unvaccinated retuning travelers (Table 3). Health care providers should stay current on the epidemiology of highly transmissible diseases, such as measles, and follow media, WHO, and CDC reports, and encourage measles vaccination for all international travelers. US travelers should remain aware of the potential for measles virus transmission throughout Europe; health care providers should maintain a high degree of suspicion for measles among international travelers returning from Europe or in patients with close contact with international travelers who present with a febrile rash illness.

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ABBREVIATIONS

ACIP	Advisory Committee on Immunization Practices
CDC	Centers for Disease Control and Prevention
MMR	measles-mumps-rubella
THN	travel health notice
WHO	World Health Organization

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TABLE 1

Countries With Measles in the WHO European Region (July 2017–June 2018)

Interrupted Transmission for ≥24 mo[a]	Endemic Disease[a]	2018 Measles Outbreak Countries (Reported Incidence per 1 Million Persons)[b]
Austria	Belgium	Belarus (>10)
Kazakhstan	Bosnia and Herzegovina	Bosnia and Herzegovina (>10)
Kyrgyzstan	France	Cyprus (>10)
Poland	Georgia	Czech Republic (>10)
Switzerland	Germany	France (>20)
Turkey	Italy	Georgia (>300)
	Romania	Greece (>200)
	Russian Federation	Ireland (>20)
	Serbia	Italy (>50)
	Ukraine	Kyrgyzstan (>50)
		Latvia (>10)
		North Macedonia (>10)
		Montenegro (>50)
		Portugal (>10)
		Romania (>50)
		Russian Federation (>10)
		Serbia (>600)
		Slovakia (>10)
		Ukraine (>600)
		United Kingdom (>10)

[a]Per the European Regional Verification Commission for Measles and Rubella Elimination.[17]

[b]Per the WHO EpiData.[16]

TABLE 2

Evidence-Based Recommendations for Measles Vaccination in International Travelers by Age Group (ACIP)

Age Group	Recommendation	Special Considerations
<6 mo	Vaccine not recommended; consider avoiding unnecessary travel to countries with circulating measles	N/A
6–11 mo	Single dose of MMR vaccine	If vaccinated before 12 mo of age, the child should be revaccinated with 2 doses Dose 1: 12–15 mo of age Dose 2: 28 d after dose 1
≥12 mo and adults	Two doses of MMR (or MMRV) vaccine separated by at least 28 d	Dose 1 should be administered at ≥12 mo of age

MMRV, measles-mumps-rubella-varicella; N/A, not applicable.

TABLE 3

Take-Home Messages

• Record numbers of measles cases in the WHO European Region in 2018 are a public health concern for US travelers to Europe.
• The CDC recommends that all travelers, including those going to the WHO European Region, be up to date on their vaccinations before travel.
• Travelers experiencing symptoms consistent with measles should seek health care immediately.
• Health care providers should stay current on the epidemiology of highly transmissible diseases, such as measles; maintain a high degree of suspicion for measles among international travelers returning from Europe with a febrile rash; follow media, WHO, and CDC reports; and encourage measles vaccination for all international travelers.